

Results of Employee Job Task Analysis (EJTA) Quality Assessment
Final Report
Combined Analysis for Fourteen Hanford Contractors

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Executive Summary

An independent quality assessment of Employee Job Task Analysis (EJTA) questionnaires completed by supervisors from the US Department of Energy's Hanford site was performed by the University of Washington (UW) and Tulane University (TU) from 1997-1999. The EJTA is an integral component of the Hanford Occupational Health Process (HOHP), a system which characterizes employee job requirements, hazards, exposures, training needs and overall risks in order to place workers in appropriate medical surveillance programs. The HOHP and its data system, Risk Management Medical Surveillance system (RMMS), also permit population-based analyses to inform risk reduction strategies.

The goals of the study were defined as:

- 1) determine how well data collected by the EJTA compares to a best estimate of true exposure potential
- 2) determine whether and how well the EJTA collects the information necessary to determine medical placement and surveillance and
- 3) determine whether the EJTA works equally well for different types of work activities and populations.

In the absence of comprehensive exposure monitoring data which would constitute a gold standard for a validation study, the quality assessment took the form of an agreement study, which compares the degree of agreement between two raters. The two raters were the Hanford supervisors who completed the original EJTA's, and an independent industrial hygiene team, who completed the second EJTA's.

TU staff selected a stratified random sample of employees. An industrial hygienist from the UW, blinded to results of the initial EJTA's, conducted interviews with employees and performed work site evaluations as necessary for the completion of new EJTA's. The new EJTA's were compared to the initial, supervisor-completed EJTA's, and comparison analyses were performed. One significant assumption for this sampling strategy was that all Hanford employees were included in the source data from which sample selection was made, and thus that the entire Hanford work population was represented in the study sample. Other assumptions and limitations of this approach are discussed in the text.

Comparison analyses were done for each section of the EJTA and the possible reasons for disagreements considered. Overall, statistical analysis yielded mixed results. Although the Kappa statistic, which measures the strength of agreement above that expected by chance, was within the desired range for several sections of the EJTA, it was very low for other sections. Sensitivities were uniformly low, indicating that some exposures, and thus some medical surveillance placements, may have been missed. Specificity was uniformly high, however, indicating that most employees who are not in medical surveillance programs do not need to be in those programs. Agreement was lowest for the Potential Exposure Hazards section of the EJTA, the most important source of information for the assignment of medical surveillance.

The EJTA generally appears to gather the correct type of data needed to make medical surveillance decisions at this time. The ability to continuously evaluate and modify the EJTA when exposure conditions or medical surveillance programs change is important.

Agreement was highest for questions where the criteria for assignment were unambiguous and directly related to the major work functions, rather than exposures or activities. Agreement was poorer for questions where significant administrative factors were present in decision-making, such as questions about the need for respiratory protection; and for exposure questions where significant professional judgment was required. This difficulty was anticipated because of the paucity of quantitative chemical exposure information. The lowest agreement was for exposure questions where agents were specified or written-in, rather than picked from a list.

Disagreements tended to be clustered in four basic groups:

- *Disagreements due to professional judgment*
- *Disagreements due to criteria interpretation*
- *Disagreements due to administrative factors*
- *Disagreements due to an inability to predict exposures in advance*

Data quality within the EJTA appears to be highly dependent on interpretation of criteria and the application of professional judgment. Acquiring additional exposure monitoring data may improve the quality of information available and hence improve the decision process. Since the EJTA is designed to be completed by supervisors and not industrial hygienists, excellent instructions and clear criteria are necessary; ongoing supervisor training will likely be needed. To address the need for clear instructions, many improvements in the help screens were made during the course of this study. The impact of these improvements has not been assessed.

A periodic review of exposure data from a trending and analysis standpoint is needed to ensure that an acceptable quality of data is maintained and that problem areas are identified early. Such review is also likely to point out areas for improved exposure assessment and ultimately the decision process for EJTA completion. We recommend that a formal, ongoing quality assurance plan involving data analysis, trending, and specific quality endpoints be developed and implemented both company-wide and Hanford site-wide. This QA should be integral to the site's ongoing Integrated Safety Management Plan verification plans. A valuable public health based preventive perspective can be gained from aggregate data analysis. While little information on adverse occupational health outcomes are available for current workers because of their relatively young age, significant information is now available through the two ongoing Hanford Former Worker projects describing latent occupational disease in Hanford workers (see appendices).

The EJTA does not address historical exposures. Historical exposures are important for determining medical surveillance needs because some occupational diseases are latent, hence medical surveillance should continue after exposure ceases. There are many ways to determine and evaluate historical exposures but since the EJTA gathers information about current exposures, it may also be an ideal vehicle to gather historical exposure data.

There may need to be changes made to EJTA or alternate methods devised to accommodate the needs of project-based work such as construction and research; the EJTA is not optimized in these settings. Although there are routine components even to project-based work, which the EJTA can adequately address, the nonroutine components do not fit well within the EJTA structure and design. Since much of Hanford work is nonroutine in nature, an alternative instrument to collect exposure information such as the Job Hazard Analysis is needed sitewide.

The EJTA was designed to deal with routine exposures and surveillance, not exposures which may change on a frequent but unpredictable basis or which fall outside the norm. The Automated Job Hazard Analysis was proposed to fill this gap, but its role has changed over time and it currently appears unable to meet these needs, particularly with regard to linking workers to exposures. The linkage of individual workers to exposure data is crucial to the EJTA, to the performance of targeted medical surveillance, and to the overall occupational health process.

Finally, we remain concerned that a significant number of employees were unfamiliar with the EJTA despite the fact that they are to review the EJTA with their supervisor and "initial" it. For the Hanford Occupational Health Process and the Integrated Safety Management System to be successful, the process and instruments used must have active employee involvement.

The Hanford Occupational Health Process has a significant achievement in the EJTA system and accompanying Risk Management Medical Surveillance system (RMMS). For the first time the majority of Hanford workers (over 12,000) are tracked and assigned to medical monitoring programs based upon risk instead of strict administrative assignments. Hundreds of useless exams have been eliminated. Population based analysis of hazards and medical outcomes is now possible. A potential liability remains however. The sensitivity of 74% for the RMMS match to medical program is lower than desired. This

finding suggests that workers who are potentially exposed are not always assigned to a medical program. While at a complex site like Hanford 100% sensitivity for this measure is very challenging to achieve, it should remain the goal of the program. Acceptance of less than 100% sensitivity should depend upon the specific risk posed by the hazard and any positive findings in medical surveillance related to hazards. The EJTA has promise as an instrument to monitor worker hazards and direct medical surveillance. Many improvements have already been made, particularly in the help screens and criteria for qualitative exposure assessment and job tasks. Better coverage both for non-routine jobs and sub-sub-contractor workers is needed along with qualitative exposure assessment and full worker participation. Ongoing evaluation of the system will be required to determine if these improvements have worked.

Introduction

An integral part of the HOHP is the Employee Job Task Analysis (EJTA), a questionnaire which gathers information about individual employees' work tasks, physical job requirements, and potential exposure hazards. Information in the EJTA is used to make decisions about placement in medical surveillance programs. Since the information in the EJTA is used for such important purposes, it is essential that the data be as accurate as possible. The purpose of this quality assessment is to determine, within the limits of the study design, the accuracy of data gathered during the first cycle of EJTA completion.

The formal goals of the study were defined as:

- 1) determine how well data collected by the EJTA compares to a best estimate of true exposure potential
- 2) determine whether and how well the EJTA collects the information necessary to determine medical placement and surveillance and
- 3) determine whether the EJTA works equally well for different types of work activities and populations.

The method of quality assessment is described in detail in Appendix A, "Revised Employee Job Task Analysis Quality Assessment Plan," jointly authored by Tulane University and the University of Washington. This report describes the combined analysis of all data collected during the study.

Methods

This study was designed to measure criterion validity, which refers to the extent to which a survey measurement device predicts or agrees with some criterion of the "true" value of the measure. A true value, or gold standard, must be available for a validation study to determine accuracy. In the absence of comprehensive exposure monitoring data which constitutes a gold standard (the "true" value of exposure, to which comparisons are made for the purposes of determining accuracy), an assessment of accuracy cannot be made.

Since the "true" condition of exposure or potential exposure for each employee is not known, an estimate was used. When estimates of exposure are used rather than the "true" exposure, agreement is determined rather than accuracy. This evaluation compares agreement between the information collected by the EJTA and an educated estimate of employee exposure. The two raters used are the Hanford supervisors who completed the original EJTA's, and an independent industrial hygiene team, who completed the second EJTA's. The independent industrial hygiene team was composed of industrial hygienists who had first-hand knowledge of Hanford work; the more familiar an industrial hygienist is with a job or industry, the more likely it is that their exposure assessments will be accurate.¹

Each employee's supervisor completed an EJTA for each worker at Hanford and an industrial hygiene representative reviewed it. The supervisor-completed EJTA's were completed between April 1997 and August 1998. A sample of these workers was selected for participation in the QA study (n= 722). For each employee in the sample, a second EJTA was completed by the QA team during the period 1997-1999. This EJTA was compared to the original supervisor EJTA to determine the level of agreement between these two sources of information.

The stratified random sample of employees (n=722) was selected from the Hanford employee roster. TU epidemiologists performed the selection, with UW industrial hygiene personnel blinded to the EJTA information collected by supervisors. The stratification was based on target levels in each occupational code. The occupational code used was from the Comprehensive Occupational Classification System, or COCS, as assigned by human resources personnel at each contractor. Each COCS had previously been rated for exposure potential. This rating was performed by the Industrial Hygiene Programs Group of Fluor Daniel Hanford, Inc., because it was felt that Hanford site staff would have the most accurate information about the relative potential for exposures among Hanford employees. A weighting scheme as determined by the COCS exposure ratings assigned 80% of workers with 'medium to high exposure' and 20% with 'low exposed,' to the sample selection to ensure that employees in the COCS codes rated

¹ Stewart PA, Stewart WF (1994) American Journal of Industrial Medicine, Vol 26:313-32. Occupational case-control studies: II. Recommendations for exposure assessment.

'medium to high exposure' would be over-represented in the sample. An oversampling factor was also applied to ensure an adequate study population despite nonparticipants.

The sample size equations² utilized an error estimate (epsilon) of 0.04, set by TU staff. This estimate means that the estimated proportion should differ from the true proportion by no more than 100 X epsilon. With the original sample size of 722, the estimated proportion of agreement should differ from the true proportion of agreement by no more than 4%. With the decrease in sample size to 491, the epsilon changes to 0.0405; thus, the stratified estimate of proportion of agreement should differ from the true proportion of agreement by no more than 4.05% with probability of 95%.

Four hundred ninety-one of the 722 selected employees participated, for a 68% participation rate. The distribution among COCS codes of the 722 selected and the 491 participating employees is shown in Tables 1 and 2. Participants were distributed among fourteen different Hanford contractors. Participation was entirely voluntary on the employee's part, and all participating employees signed consent forms. Of the 231 nonparticipants, ninety-one employees (13%) declined participation, and 140 employees (19%) were no longer employed. Details of nonparticipants are shown in Table 3.

We do not have complete information about the reasons for employees declining participation, since employees could decline participation for any reason, at any stage in the process, and by a variety of methods including telephone, email, or personal contact with either an interviewer or the company representative. Many employees who declined participation did not state a reason for their decision. We have not evaluated what bias this may introduce into the study.

Table 1
Distribution of Selected Employees among COCS Codes

COCS Category	Sample Count	Sample Percent	Total Hanford Employment	Percent of Total Hanford Employment
'C' Crafts	80	11	941	8
'E' Engineers	119	17	2357	19
'G' Administrative	44	6	1502	12
'L' Laborers	53	7	837	7
'M' Managers	65	9	1477	12
'P' Professional	90	12	2012	16
'R' Operators	81	12	731	6
'S' Scientists	67	9	1033	8
'T' Technicians	123	17	1404	11
Total	722	100	12294	100

² Levy PS, Lameshow S (1991) Sampling of Populations: Methods and Applications. New York: Wiley.

Table 2
Distribution of Participating Employees within COCS Codes

COCS Category	Participant Count	Percent of Total Participants	Percent of COCS Category Participating
'C' Crafts	51	10	64
'E' Engineers	87	18	73
'G' Administrative	29	6	66
'L' Laborers	33	7	62
'M' Managers	46	9	71
'P' Professional	70	14	78
'R' Operators	52	11	64
'S' Scientists	39	8	58
'T' Technicians	84	17	68
Total	491	100	68

Table 3
Nonparticipant Characteristics

Category	Reason for Nonparticipation	Number of Nonparticipants in each Sample category	Percent of Nonparticipants in each Sample Category
'C' Crafts	No longer employed Declined participation	20 9	36%
'E' Engineers	No longer employed Declined participation	16 16	26%
'G' Administrative	No longer employed Declined participation	9 6	34%
'L' Laborers	No longer employed Declined participation	12 8	38%
'M' Managers	No longer employed Declined participation	12 7	29%
'P' Professional	No longer employed Declined participation	16 4	22%
'R' Operators	No longer employed Declined participation	19 10	35%
'S' Scientists	No longer employed Declined participation	12 16	42%
'T' Technicians	No longer employed Declined participation	24 15	32%
Total		231 (32% of total)	

Employees were notified by their manager of their selection for inclusion in the QA process, and were scheduled for an interview. Employee interviews were scheduled at the employee's work location. During the interview, employees were asked to describe their work tasks and duties. A semi-structured format with both open- and closed-ended questions was used (See Appendix B). Employees were asked about the physical activities performed during their jobs; the materials and chemicals used; and the use of personal protective equipment. They were also asked to identify qualification exams that they believed were requirements of the job. Worksite evaluations were conducted when possible, especially when employees reported specific work activities that might produce potential exposures. Material Safety Data

Sheets (MSDSs) and past exposure records were also reviewed when available and appropriate. Finally, workers were asked several questions designed to gauge their familiarity and involvement with the EJTA process.

After completion of each interview, work site evaluation, and records review, a new EJTA was completed for the employee by the QA evaluator. This EJTA was submitted to the University of Washington and Tulane University data analysis team for data entry and analysis.

Analysis

Following independent data collection by the QA-IH, data contained in the original supervisor-completed EJTA was obtained from the Risk Management Medical System (RMMS). The EJTA completed by the QA-IH for each employee was compared to the initial, supervisor-completed EJTA for that employee, and responses were compared and cross-tabulated. The percent disagreement method is based upon a detection level of 20% or more, with potential for disagreement due to chance $\leq 5\%$.

Agreement of the QA-IH EJTA and the supervisor EJTA was assessed with the Kappa statistic which, unlike percent agreement, corrects for chance-expected agreement and level of agreement. For the Physical Job Requirements and the Potential Exposure Hazards sections, responses can be of three levels, therefore the weighted Kappa (K_w) is indicated to assess agreement for these sections. The Kappa, and weighted Kappa, provide the following index for strength of agreement.³ A Kappa of 0.5 is generally considered adequate agreement for data sources for instrument testing. Statistical significance may be reached while the level of agreement is unimpressive. That is, even with a K of less than 0.5 agreement may be more than that expected by chance alone with a resulting P value of less than 0.05. A K less than 0 indicates less agreement than would be expected by chance.

Table 4
Kappa Agreement

Value of Kappa	Strength of Agreement
<0	Poor
0-.20	Slight
.21-.40	Fair
.41-.60	Moderate
.61-.80	Substantial
.81-1.00	Almost perfect

Sensitivity and specificity were calculated for the Medical Qualification Examinations, Other Exposure Information, and RMMS/QA-MD Medical Surveillance Program Placement sections. Sensitivity is the probability that a worker was assigned to a program by the supervisor and should have been assigned to the program, according to the QA Team. Specificity is the probability that a worker was not assigned to a program by both the supervisor and QA Team. Low sensitivity results in greater worker risk and increased liability while low specificity results in extra cost for programs which may not be indicated. A sensitivity of 90% or greater is desirable (Table 5).

It should be noted that the meaningful interpretation of sensitivity and specificity is hindered by the fact that there is no gold standard for this process. Both supervisors and QA Team are relying on educated exposure estimates. Exposure estimates in the EJTA correlate directly to program placements in RMMS. To the extent that our exposure estimates may be uncertain, so also may resulting placements and the resulting sensitivity and specificity.

In the following table, boxes labeled a, b, c, and d, and corresponding numerical values from specific data tables are used directly to calculate the sensitivity ($a/(a+c)$) and specificity ($d/(b+d)$).

³ Landis, JR, Koch, GG (1977) Biometrics, Vol 33: 159-74. The measurement of observer agreement for categorical data.

Table 5
Relationships between Supervisors and QA-IH Determinations

		QA-IH EJTA/QA-MD Determination	
		Yes	No
Supervisors' EJTA/RMMS Determination	Yes	Agreement (a)	Extra cost for provision of unnecessary medical surveillance (b)
	No	Liability for inappropriate exclusion from medical surveillance (c)	Agreement (d)

Results

Results are presented by each section of the EJTA: Physical Job Requirements, Medical Qualification, Potential Exposure Hazards, Other Exposure Information, and RMMS Program Assignment (Appendix C: EJTA Instrument). High agreement between the two raters for individual items is taken as evidence of high quality data. Conversely, low levels of agreement indicate that the quality of data collected is questionable and that the EJTA may not be accurately describing worker medical program needs. There can be many reasons for disagreements; the major reasons for disagreements are outlined in each section and discussed in more detail in the Conclusions.

Section 1: Physical Job Requirements

The Physical Job Requirements (PJR) section of the EJTA asks the user to indicate the frequency of an activity performed as part of the job. The responses are presented in Table 6. This table presents the number of responses, not the number of individuals. Excluding missing data, there are 29 responses for each individual, resulting in a total of 14239 responses per rater (29 items x 491 people = 14239 responses.) Of the 14239 responses, 9743 were in agreement, for agreement of 68%.

Disagreements were characterized first or second order. First order disagreement refers to supervisor and QA-IH assignments for the same person that varied by one category (i.e. supervisor rated activity as rare or never occurred and QA-IH rated activity frequency as <1/3 of the time). Second order disagreement refers to assignments which varied by two categories (i.e. supervisor rated activity as rare and QA-IH rated activity frequency as >1/3 of the time).

Table 6
Supervisor and QA-IH Physical Job Requirements Section Responses

Physical Job Requirements	Frequency of Activity						Disagreements*			
	Supervisor			QA-IH			Supervisor		QA-IH	
Frequency of activity	Rarely	≤ 1/3	> 1/3	Rarely	≤ 1/3	> 1/3	1	2	1	2
Sitting	23	207	261	32	128	331	35	2	92	4
Standing	42	299	150	142	209	140	152	21	79	3
Walking Even Surface	45	310	136	50	240	201	83	4	123	13
Walking Uneven Surface	243	201	47	275	142	74	81	7	82	4
Running	470	21	0	478	12	1	13	0	6	0
Kneeling	297	182	12	332	133	26	76	3	59	1
Crawling	415	73	3	422	65	4	44	0	37	1
Climbing Legs Only	263	207	21	261	191	39	93	8	115	7
Climbing Hands and Legs	336	136	19	358	112	21	69	4	51	3
Reaching Above Shoulders	250	202	39	339	106	46	119	13	59	0
Bending	214	202	75	272	134	85	109	12	77	4
Twisting	250	186	55	291	124	76	94	10	80	7
Straight Pulling	324	137	30	351	109	31	83	9	61	7
Repetitive Motion	221	137	133	327	69	95	107	69	56	23
Pulling Hand Over Hand	400	72	19	428	53	10	44	10	21	3
Pushing	341	122	28	368	96	27	66	8	44	5
Lifting Carrying 50 lbs.	400	87	4	409	67	15	50	0	40	6
Lifting Carrying 30 to 50 lbs.	270	178	43	293	135	63	85	4	76	7
Fine Finger Movement	306	113	72	265	85	141	51	21	93	55
Both Hands Required	176	100	215	126	59	306	38	24	99	64
Both Legs Required	220	101	170	183	53	255	34	20	98	49
Operating Heavy Equipment	461	21	9	470	9	12	21	5	9	8
Operating Motor Vehicles	250	200	41	231	187	73	72	5	119	7
Operating Machinery	366	88	37	387	59	45	43	15	50	5
Computer Work Station	88	172	231	95	107	289	53	2	94	7
Material Handling Equipment	383	77	31	390	74	27	47	7	38	6
Confined Areas	376	108	7	424	62	5	75	2	25	2
Working Hot Environments	305	117	69	303	98	90	56	5	69	11
Working Cold Environments	308	114	69	298	103	90	53	7	74	12
Total	8043	4170	2026	8600	3021	2618	1946	297	1926	324

* Count of disagreement by level of disagreement. Disagreements are listed under the rater who indicated greater requirements, and by order of disagreement:

First Order: Supervisor and QA-IH assignments varied by one category (i.e. supervisor rated activity as rarely and QA-IH rated as <1/3 of time)

Second Order: Supervisor and QA-IH assignments varied by two categories (i.e. supervisor rated activity as rarely and QA-IH rated as > 1/3 of time)

The columns in Table 7 represent the QA-IH's ranking, either 0 (activity rarely or never performed), 1 (activity performed up to one-third of the time), or 2 (activity performed more frequently than one-third of the time). The rows in the table represent the supervisors' ranking from 0 to 2. The shaded diagonal on the table indicates observations for which the supervisors and the QA-IH agreed.

Table 7
Supervisor and QA-IH Physical Job Requirements Activity Frequency

		QA-IH			
Supervisors		0	1	2	Row total
Rarely Performed	0	6806 ⁰⁰	910 ⁰¹	327 ⁰²	8043
≤ 1/3 of the time	1	1496 ¹⁰	1660 ¹¹	1014 ¹²	4170
> 1/3 of the time	2	298 ²⁰	451 ²¹	1277 ²²	2026
Column total		8600	3021	2618	14239

Multiplying the 29 items in the PJR section by the 491 employees included in the study, each rater made a total of 14239 observations. The raters agreed 6806 times that the activity was never performed; they agreed 1660 times that the activity was performed up to one-third of the time, and 1277 times that the activity was performed more than one-third of the time. This resulted in a total of 9743 instances of agreement out of a possible 14239, or 68% agreement (Table 7 shaded cells).

In Table 7, cells labeled ⁰⁰, ¹¹, and ²² indicate agreement, disagreement by one category, and disagreement by two categories, respectively. Cells above the diagonal (cells on the diagonal are shaded and labeled ⁰⁰) show disagreements where the QA-IH assigned a higher frequency for the activity than the supervisors, and cells below the diagonal show occurrences where the supervisors assigned a higher frequency for the activity than the QA-IH.

Overall, the QA-IH tended to assign higher frequencies of activity, giving 56% of the total category 2 rankings. Another way to illustrate this is that the QA-IH gave 1014 category 2 rankings which were ranked by the supervisor as category 1, while the supervisor gave only 451 rankings of category 2 which were ranked by the QA-IH as category 1.

However, there were instances where supervisors gave higher rankings; for instance, there were 1496 instances in which the QA assigned a ranking of category 0, but the supervisor assigned a higher ranking of category 1.

When considering the chance-expected level of agreement, there was a K_w of 0.53, indicating moderate agreement between the QA-IH and supervisors for this section. There was significant agreement beyond that expected by chance alone ($p < 0.05$).

There are a number of possible explanations for the disagreements. One explanation for some disagreements is criterion variance, or differences in the way that assignment criteria are interpreted by raters. This is especially likely when the instructions or assignment criteria are not formalized or standardized. Instructions for this section of the EJTA have been greatly improved over the last year, with examples given for most items. A test of these improvements would be instructive.

It is also likely that employee perceptions of job requirements differ from supervisor perceptions, and the QA-IH weighted information from the interview quite heavily in determining frequency of activity ratings. Employees may unknowingly over- or under-represent the physical demands of their jobs, depending on their own perceptions and beliefs about their work. An isolated interview, without extensive direct observation of work activities, may not be able to elicit the range and degree of physical job activities with accuracy.

Conversely, supervisors may not be fully aware of the physical job activities performed by their staff, or that they may over- or underestimate the frequency of activity. Determining physical job requirements is a complex task which usually requires special training and always requires considerable employee input.

In some cases, job duties changed between completion of the initial EJTA and completion of the QA EJTA, meaning that physical job requirements have also changed, but this did not appear to account for most differences.

In summary, there were a number of disagreements in the Physical Job Requirements category. Disagreements were over the frequency of activity and whether or not the activity was performed at all. Given the complex task of defining physical job requirements and the disagreements found between supervisor and QA-IH, it may be that the assessment methodology is not refined enough to differentiate frequency of activity with an acceptable degree of accuracy. This category may not have significant impact on worker health and safety at the present time. Because of these significant discrepancies, we do not recommend using information in this category for Americans with Disability Act (ADA) or return-to-work purposes.

Section 2: Medical Qualification

This section of the EJTA asks the user to indicate whether a medical qualification examination is required of the employee to perform the job. Analysis of this section indicated a high level of agreement with many employees not requiring examinations (Tables 8 and 9). There was agreement between the supervisor and QA-IH responses on 6647 of 6834 observations for an overall percent agreement of 98%.

Table 8
Supervisor and QA-IH Medical Qualification Examination Section Responses

Medical Qualification Examination	Supervisor		QA-IH		Disagreement*	
	Yes	No	Yes	No	Supervisor	QA-IH
Crane Operator	22	466	17	471	8	3
Driver with CDL	25	463	23	465	3	1
Fissile Material Handler	28	461	29	459	5	6
Respirator Wearer Routine	200	288	185	304	29	14
Respirator Wearer Non Routine	42	446	45	443	30	33
Personnel Security Assurance Program	22	466	23	465	0	1
Quality Control Inspector	8	480	7	481	1	0
Bloodborne Pathogens	76	413	66	423	26	16
Nuclear Reactor Operator	0	488	0	488	0	0
Tower Climber	7	481	13	475	2	8
Wildlife Handler	1	487	0	488	1	0
Hanford Patrol Security Police Officer II	6	482	6	482	0	0
Hanford Patrol Security Police Officer III	3	485	3	485	0	0
HAZMAT Firefighter	4	484	4	484	0	0
Total	444	6390	421	6413	105	82

* Disagreements are listed under the rater who indicated the exam was needed.

Table 9
Supervisor and QA-IH Medical Qualification Examination Agreement

Supervisors		QA-IH		
		Yes	No	Total
Yes		339	105	444
No		82	6308	6390
Total		421	6413	6834

Sensitivity = 81%, Specificity = 98%
Agreement 97% Kappa 0.77, P < 0.05

Of the 421 assignments the QA-IH made for medical examination, 82 were not made by the supervisors resulting in a sensitivity of 81% (Table 9). Of the 6308 assignments the QA-IH did not include in examinations, 105 were included by the supervisors, resulting in a specificity of 98%. When considering the chance-expected level of agreement, there was substantial agreement between the supervisors and

QA-IH with $K = 0.77$. The agreement was beyond that expected by chance alone ($p < 0.05$).

The largest number of disagreements were seen in the Respirator Wearer Routine and Nonroutine categories, and in the Bloodborne Pathogens category. Most of the Respirator Wearer disagreements were not related to whether an employee does or does not need any type of respirator clearance, but rather to whether the employee needed routine or nonroutine qualification. That is, most disagreements were cases where the supervisor rated the employee as needing routine qualification and the QA-IH rated the employee as needing nonroutine qualification, or vice versa. Nonroutine qualification is suitable for those employees who use respirators irregularly and can predict about two weeks ahead of time when they will need it, so that qualification and fitting can be scheduled. Routine qualification is suitable for those who use respirators regularly throughout the year, or for those with irregular or emergency use where the dates of use cannot be predicted ahead of time.

There is a significant administrative component to the assignment of respirator use categories, in terms of workforce flexibility and management control over work. Certainly the QA-IH team was not as well equipped as the supervisors to make determinations based solely on administrative concerns. For that reason, disagreements in the respirator use categories are not likely very significant; however, workers should be aware of whether their supervisor considers them a routine or nonroutine user.

There were also a number of disagreements in the Bloodborne Pathogens category. The majority of these disagreements were cases where the supervisor rated the employee as needing this qualification program when the QA-IH did not. There were a lesser number of cases where the QA-IH rated the employee as needing the qualification when the supervisor did not. Most employees who clearly need enrollment, such as Radiation Control Technicians and Firefighters, were appropriately rated by both supervisor and QA-IH. These disagreements appeared to be due almost entirely to criteria interpretation; it appeared that this category was not well understood by supervisors, especially with regard to Designated First Aid Providers.

Most questions in this section of the EJTA relate to work functions, rather than exposures. Questions which relate to work functions tended to have well-defined criteria, especially if there are federal or state regulations defining the criteria. Agreement tended to be high on these types of questions, such as HAZMAT/Firefighter and Security Police qualifications. Interviewed employees tended to know with certainty when this type of qualification was needed. Some questions of this type may have criteria which are Hanford or contractor-specific. Agreement was slightly lower in questions such as these, which include Crane Operator, Fissile Material Handler, and Tower Climber, probably because the criteria for these questions were not as specific as others. Employees often did not appear to clearly understand whether or not these programs applied to their jobs.

This section demonstrates that making criteria and instructions as concise and prescriptive as possible will help supervisors make the right decisions for their employees. Supervisors need to understand the reason for the qualification, what tasks or work functions would merit qualification, and what qualifications are likely to be required for work tasks in their areas of responsibility.

Section 3: Potential Exposure Hazards

The Potential Exposure Hazards (PEH) section asks the user to indicate, for each of 22 occupational hazards, whether the employee is, or will be, potentially exposed to those occupational hazards during the next year (Table 10). The user may also specify any additional agents not listed on the form to which the employee may have potential exposure. Results are presented separately for listed hazards and write-in, or unspecified, hazards. Exposures were characterized in this report as Category 0: No exposure for the occupational hazard or agent; Category 1: Exposure less than criteria; Category 2: Exposure greater than the criteria, but less frequently than 30 days per year; and Category 3: Exposure greater than the criteria and with a frequency of 30 days or more per year. Category 2 or 3 automatically triggers a monitoring program if one exists for the hazard.

Disagreement columns describe the degree of difference between the supervisor and QA-IH assignment for each participant. First order disagreement occurred when the supervisor and QA-IH assignments differed by one category (i.e. supervisor rated exposure 0 and the QA-IH rated exposure 1, or 1 vs. 2, or

2 vs. 3). Second order disagreement occurred when the assignments differed by two categories (i.e. 0 vs. 2 or 1 vs. 3). Third order disagreement occurred when assignments differed by three categories (i.e. 0 vs. 3).

Section 3A. Potential Exposure Hazards, Listed Hazards

Supervisors and QA-IH disagreements for the 22 listed occupational hazards are shown in Table 10. Of the 10802 observations (491 participants X 22 items), 9794 agreed, resulting in an agreement of 91% (Table 11). There was moderate agreement between the supervisors and QA-IH with a K_w of 0.46 which is beyond that expected by chance alone ($p < 0.05$).

Table 10
Supervisor and QA-IH Potential Exposure Hazards Section Responses
Listed Occupational Hazards

Potential Exposure Hazards	Supervisors*				QA-IH*				Disagreement**					
									Supervisors			QA-IH		
	0	1	2	3	0	1	2	3	1	2	3	1	2	3
Arsenic Inorganic	476	15	0	0	488	3	0	0	15	0	0	3	0	0
Asbestos	367	93	28	3	363	105	22	1	45	12	0	63	0	0
Benzene	468	23	0	0	489	2	0	0	22	0	0	1	0	0
Beryllium	474	17	0	0	485	5	1	0	16	0	0	4	1	0
Cadmium Inorganic	472	18	1	0	490	1	0	0	18	1	0	1	0	0
Formaldehyde	474	17	0	0	490	1	0	0	16	0	0	0	0	0
Lead Inorganic	353	116	20	2	385	93	12	1	75	8	1	48	1	1
Noise	270	118	83	20	250	115	100	26	65	3	1	88	16	1
Paints Lead Based	441	46	4	0	480	8	2	1	42	4	0	6	1	1
Paints Chromium	461	26	4	0	485	4	1	1	24	4	0	2	1	1
Welding Metal Fumes	444	41	5	1	463	25	2	1	37	2	0	15	2	0
Welding Chromium	467	22	1	1	474	13	3	1	16	1	0	9	2	0
Welding Nickel	467	22	1	1	473	14	3	1	16	1	0	10	2	0
Corrosives Isocyanates	476	15	0	0	489	2	0	0	14	0	0	1	0	0
Corrosives Epichlorohydrin	476	15	0	0	490	1	0	0	15	0	0	1	0	0
Corrosives Chlorine	464	27	0	0	488	2	1	0	26	0	0	3	0	0
Corrosives PCBs	444	47	0	0	471	18	2	0	34	0	0	9	0	0
Corrosives Ammonia	410	81	0	0	448	42	1	0	43	0	0	6	0	0
Corrosives Mercury	459	32	0	0	470	21	0	0	24	0	0	13	0	0
Particulates Coal Dust	481	10	0	0	491	0	0	0	10	0	0	0	0	0
Particulates SV Fibers	450	41	0	0	484	5	2	0	40	0	0	6	1	0
Laser Light	467	22	2	0	477	10	3	1	22	1	0	10	2	1
Total	9761	864	149	28	10123	490	155	34	635	37	2	299	29	5

* Category of exposure level on the EJTA

** Count of disagreement by level of disagreement. Disagreement is listed under the rater who indicated more exposure.

Table 11
Supervisor and QA-IH Potential Exposure Hazards Section
Agreement, Listed Occupational Hazards

Supervisor Rating	QA-IH Rating				Total
	0	1	2	3	
0	9512	226	18	5	9761
1	578	216	59	11	864
2	31	42	62	14	149
3	2	6	16	4	28
Total	10123	490	155	34	10802

Kappa, weighted, = 0.46, $P \leq 0.05$

Included in the Potential Exposure Hazards section was an indication of whether there were quantitative data available regarding the hazard. Supervisor and QA-IH responses are shown in Table 12. The QA-IH and supervisors agreed that quantitative data were not available for most hazards. Of the 10802 possible responses, 10618 were in agreement, resulting in overall percent agreement of 98%.

Table 12
Supervisor and QA-IH Potential Exposure Hazards, Listed Hazards
Quantitative Data Section Responses

Potential Exposure Hazards	Supervisor Yes	QA-IH Yes	Disagreement*	
			Supervisor	QA-IH
Arsenic Inorganic	0	0	0	0
Asbestos	33	12	29	8
Benzene	0	0	0	0
Beryllium	0	0	0	0
Cadmium Inorganic	0	0	0	0
Formaldehyde	0	1	0	1
Lead Inorganic	46	8	38	0
Noise	73	28	62	17
Paints Lead Based	3	1	3	1
Paints Chromium	0	0	0	0
Welding Metal Fumes	2	2	2	2
Welding Chromium SS	0	1	0	1
Welding Nickel SS	2	1	2	1
Corrosives Isocyanates	0	0	0	0
Corrosives Epichlorohydrin	0	0	0	0
Corrosives Chlorine	3	0	3	0
Corrosives PCBs	1	0	1	0
Corrosives Ammonia	8	6	6	4
Corrosives Mercury	2	0	2	0
Particulates Coal Dust	0	0	0	0
Particulates SV Fibers	0	0	0	0
Laser Light	1	0	1	0
Total	174	60	149	35

*Count of disagreement. Disagreements are listed under the rater who indicated data available.

Table 13
Supervisor and QA-IH Potential Exposure Hazards
Quantitative Data Available

Supervisors		QA-IH		
		Yes	No	Total
	Yes	25	149	174
	No	35	10593	10628
Total		60	10742	10802

Sensitivity = 42%, Specificity = 99%
Agreement 98% Kappa 0.21, P < 0.05

Section 3B. Potential Exposure Hazards, Additional Hazards

Supplementary to the listed hazards, the raters also specified additional hazards (write-in or unspecified hazards). The responses are summarized in Table 14. Because the process for requesting this additional hazard data is different and open ended responses are listed, we expected different rates of agreements, and thus the two types of data are presented separately. There was agreement of 11842 of the possible 13114 (491 workers X 27 hazards) observations for an overall percent agreement of 89%. However, this percent agreement is based on using the total number of items in the table as the denominator, rather than only agreement of the additional hazards actually listed. There was only slight agreement between supervisors and QA-IH with K_w of 0.16 which was more than that expected by chance ($p < 0.05$). For an example of the magnitude of difference in agreement using the total number of items as denominator, see DynCorp specific contractor QA report of February 10, 1999, page 14.

Table 14
Supervisor and QA-IH Potential Exposure Hazards Section Responses
Additional Occupational Hazards by Category* of Hazard

Potential Exposure Hazards By Category	Supervisor						Disagreement**					
	Supervisor			QA-IH			Supervisor			QA-IH		
	1	2	3	1	2	3	1	2	3	1	2	3
1. Paints/Resins/Solvents	102	0	0	33	0	0	88	0	0	19	0	0
2. Welding	44	6	0	18	5	1	42	4	0	15	4	1
3. Carcinogens	8	0	0	3	0	0	8	0	0	3	0	0
4. Other Carcinogens	32	0	0	29	2	1	28	0	0	29	1	0
5. Chlorinated Solvents	42	1	0	30	1	0	32	0	0	19	0	0
6. Other Solvents/Vapors	153	0	0	110	4	0	134	0	0	94	3	0
7. Corrosives	78	11	3	75	1	0	68	3	3	49	1	0
8. Chemicals	80	5	0	176	9	2	51	2	0	141	9	2
9. Hazardous Waste	93	7	8	75	1	0	72	7	8	54	1	0
10. Particulates	167	10	0	141	28	5	133	6	0	111	22	5
Total	799	40	11	690	51	9	656	22	11	534	41	8

* Items within the category are combined for comparison. For example, any of the three written-in solvent variables are considered of equal rank and are combined into a single variable for comparison.

** Order of disagreement: first, second, or third order disagreement.

Table 15
Supervisor and QA-IH Additional Potential Exposure Hazards Agreement

Supervisor	QA-IH				Total
	0	1	2	3	
0	11689	527	40	8	12264
1	642	149	7	1	799
2	22	14	4	0	40
3	11	0	0	0	11
Total	12364	690	51	9	13114

Kappa, weighted, = 0.16, P, 0.05

The availability of quantitative data, by category, is shown in Table 16. There was agreement on 13049 of the 13114 (491 workers x 27 items) observations, resulting in agreement of 99%.

Table 16

Supervisor and QA-IH Potential Exposure Hazards, Additional Hazards
Quantitative Data Section Responses

Potential Exposure Hazards	Supervisors	QA-IH	Disagreements*	
	Yes	Yes	Supervisors	QA-IH
Paints/Resins/Solvents	1	2	1	2
Welding	2	1	2	1
Carcinogens	0	0	0	0
Other Carcinogens	4	0	4	0
Chlorinated Solvents	1	2	0	1
Other Solvents/Vapors	18	0	18	0
Corrosives	0	0	0	0
Chemicals	1	1	1	1
Hazardous Waste	18	7	18	7
Particulates	9	2	8	1
Total	54	15	52	13

Discussion of Disagreements for Potential Exposure Hazards Section

Supervisors and QA-IH agreed that many workers were not exposed to any hazard (Figure 1). Table 17 shows exposure by COCS class and exposure level. Sixty-three percent of employees sampled were rated by either supervisor or QA-IH as having any potential exposures, but only 33% of employees were rated as exposed above an occupational exposure level (OSHA Permissible Exposure Level, ACGIH Threshold Limit Value, or USDOE value). The percentage of exposed workers is slightly lower than projected in the sampling strategy, which assumed that 80% of the sampled employees would have medium to high potential of exposure. This is not explained by nonparticipation, since the percent of employees in each occupational classification remained approximately the same despite nonparticipants. More likely, the original exposure classifications overestimated the potential for exposures.

Figure 1
Number of Employees Rated Potentially Exposed by either QA-IH or Supervisor, by Highest Exposure Ranking Given

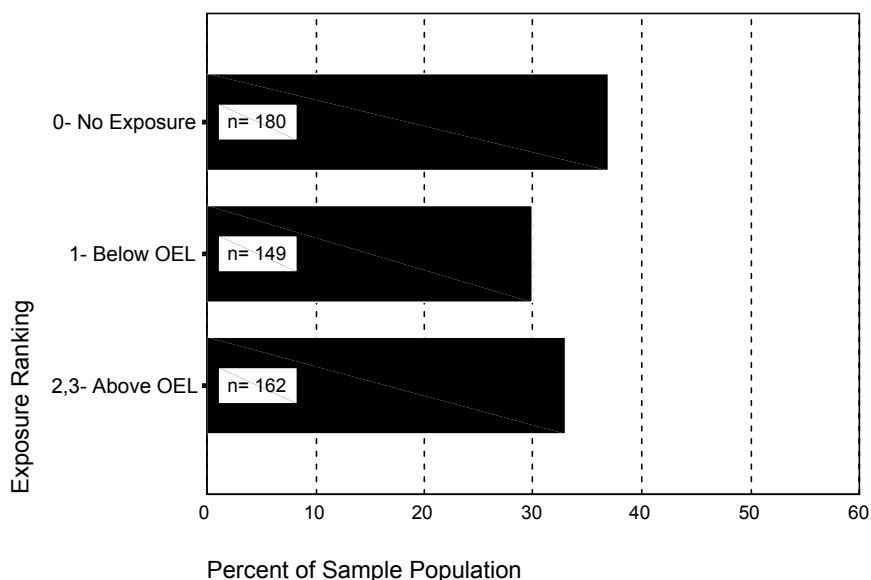


Table 17
Number of Employees Rated Potentially Exposed by Either QA-IH or Supervisor,
by Highest Exposure Ranking Given, by COCS Category

COCS Category	Exposure Ranking					
	Number of Employees Exposed			Percent of Participants (n= 491)		
	0 – No Exposure	1 – Exposed below an OEL for < 30 days per year	2/3 – Exposed above an OEL for < or > 30 days per year	0 – No Exposure	1 – Exposed below an OEL for < 30 days per year	2/3 – Exposed above an OEL for < or > 30 days per year
'C' Crafts	0	11	40	0	2	8
'E' Engineers	46	31	13	9	6	3
'G' Administrative	25	5	0	5	1	0
'L' Laborers	1	11	22	0	2	4
'M' Managers	30	9	6	6	2	1
'P' Professional	46	17	6	9	3	1
'R' Operators	0	10	40	0	2	8
'S' Scientists	15	19	5	3	4	1
'T' Technicians	17	36	30	3	7	6
Total	180	149	162	37	30	33

Agents most frequently rated as exposures in any category are shown in Table 18. Noise, solvents, and particulate matter emerged as most frequently rated by both supervisors and QA-IH. Asbestos and lead were other agents where both supervisor and QA-IH both gave relatively high numbers of rankings.

Table 18
Total Employees Exposed at Any Level by Supervisor or QA-IH

Exposure Agent	Number Exposed per Supervisor	Number Exposed per QA-IH	Difference	
			Supervisor	QA-IH
Noise	221	241		20
Solvents (write-in)	196	145	51	
Particulates	177	174	3	
Lead	138	106	32	
Asbestos	124	128		4
Hazardous waste	108	76	32	
Paints/resins/solvent (write-in)	102	33	69	
Welding	97	52	45	
Corrosives	92	76	16	
Misc. chemicals	85	187		102
Ammonia	81	43	38	

When considering the number of exposure *rankings* given, as opposed to the number of *employees* potentially exposed, the vast majority of exposure rankings were category 0, the default ranking of no exposure. There were 3320 rankings of 1 or higher given by the supervisor and QA-IH combined; of those, 2843 (86%) were category 1, and 477 (14%) were category 2 and 3, triggering a medical program enrollment.

There was an slight overall trend for the supervisors to be more conservative than the QA-IH; that is, the supervisors assigned exposures to more employees than did the QA-IH. Although this was true overall, it

was not true for every category of exposure. Supervisors gave 58% of all category 1 exposures, but only 48% of all category 2 and 3 exposures. The QA-IH gave 42% of all category 1 exposures, but 52% of all category 2 and 3 exposures.

Of the total rankings given by the supervisor, 12% were rankings of category 2 or higher. Of the total rankings given by the QA-IH, 17% were rankings of category 2 or higher. Although this is a 5% difference, the overall numbers of category 2 and 3 rankings were quite small and thus these percent differences do not represent large numbers.

Agreement for the listed hazards portion of the PEH was 91% with Kappa of 0.46, which indicates moderate agreement. Agreement for the write-in section of the PEH was 89%, but with Kappa of 0.16 which indicates only slight agreement. Although the percent agreement numbers for both sections appear high, percent agreement is somewhat deceiving because the true agreement is diluted by the large number of category 0 exposures. That does not mean that the determination of no exposure, or category 0, is not important, only that the large number of these rankings makes it more difficult to “see” the other agreements and disagreements. Kappa is the better measure of agreement, and Kappa values were lower than desirable; a Kappa of 0.50 or greater is generally considered acceptable for data sources for agreement testing.

Despite the relatively high percent agreements, Kappas were less than desirable because when exposures were ranked by either QA-IH or supervisor, there was often disagreement as to the frequency and/or magnitude of exposure. In a number of cases there was disagreement over whether exposure occurred or not.

Kappa was especially low in the write-in section. Although the primary reason for low agreement was that supervisors and QA-IH did not agree on either the existence, frequency, or magnitude of exposure, there are special factors to consider in this section. There are an infinite number of agents which could be written in by supervisor or QA-IH. In many work situations, employees may have available for use several different chemicals within the same chemical class. Selecting the most important to enter on the EJTA is a highly subjective matter, and the EJTA does not provide guidance on how to make these decisions (by toxicologic properties, frequency of use, or other factors). Often there was agreement by hazard class (corrosives, chlorinated solvents, etc.), but not precisely by agent.

Another complication for analysis in the write-in hazards section was that agents could be entered in different categories; in some cases the supervisor placed an agent in one category and the QA-IH in another, and it seemed likely the exposures resulted from the same activity. Because our analysis methods separated the data by category, some of these disagreements would have been agreements if we had pooled all the written-in agents. However, this method of analysis was not possible because there are important distinctions between some categories.

An additional factor influencing the poor agreement in the write-in section was that multiple entries were often made on a line. The RMMS system looks only at the first entry on a line and we used this same scheme for matching. Agreement would have been higher if we had considered all entries on a line, not just the first.

Disagreements were analyzed for type and reason, and we found that there are four basic types of disagreements. These four categories of disagreement, listed in no special order, are:

1. Disagreements due to professional judgment

These disagreements relate to differences in judgment, such as when an exposure is or is not significant enough to be included on the EJTA. This is related directly to an individual's skills in identifying exposures and in evaluating and interpreting the quality/quantity of available data. This may include such factors as determining the relevancy of average and peak exposures or estimating quantitative exposures when data is limited. Differences in this category may also be related to beliefs and perceptions held by employees or supervisors, especially with regard to whether work poses risk and whether such risk is acceptable.

2. Disagreements due to criteria interpretation

These disagreements are due to a difference in the way EJTA instructions or criteria are interpreted. This

is related to the clarity and precision of criteria, and whether criteria are understood by the rater. Factors which may influence disagreements of this nature are cases where regulations do not fit well into specified categories or criteria (lead, asbestos); where substances do not have occupational exposure limits; where exposure routes are not represented in the EJTA; or where a company has an internal criteria or standard that conflicts with the EJTA. There may be instances where individuals have difficulty applying criteria to a particular situation. There are also likely to be circumstances where people feel criteria are insufficient or incorrect and may thus make interpretations or rankings based on their own belief of what the criteria should be.

3. Disagreements due to administrative factors

These are disagreements related to administrative or management factors rather than exposures. Decisions made for these reasons require a type of knowledge that the QA-IH was not likely to possess, especially since we talked primarily with employees and not managers. For instance, there may be a management need (or perception of need) that all workers in the same job class must be ranked the same for union or job flexibility reasons. Other factors which may result in these disagreements are access issues and job changes that occurred between the completion of supervisor and QA-IH EJTA.

4. Disagreements due to an inability to predict exposures in advance

These disagreements are related to the difficulties of predicting work, and accompanying exposures, in a dynamic work environment such as construction, research, or maintenance. The QA-IH was at a disadvantage in this regard when talking primarily with employees, who may receive their assignments on short notice and may not know what type of work they will be doing in the future. Although there is correlation between occupation and exposure based on the type of work usually done in the occupation, the environment in which the work is performed may also contribute to exposures, and this is not as easy to predict. Although the QA-IH was at a disadvantage in predicting work because of being an outsider, it appeared that supervisors also had difficulty with this task.

The issue of exposure pathway is not addressed by EJTA; the route of exposure cannot be defined, and exposures are assumed to be by inhalation. There may be instances where dermal exposure is important. The ability to include dermal exposures in the exposure rankings should be addressed in the EJTA. The exposure ranking categories applied to EJTA exposures do not apply to dermal exposures, so consideration must be given to an appropriate rating scale or other method for indicating the presence of potential dermal exposures.

There are several exposure questions for which criteria either are not sufficiently clear, or where the regulations are complex enough that a "fit" within the three exposure categories is difficult. Exposure questions for which criteria appear to need further development include laser light, asbestos, and lead.

A continuing issue for the EJTA is that of de minimis or low level exposures; the EJTA criteria are unclear on whether such exposures should be recorded on the PEH or not, and professional judgments on this matter are likely to vary widely. The difference between an agent rated 1 on the EJTA PEH and not rated at all (considered 0 for our purposes) may be insignificant. Many agents rated 1 on the PEH are likely to be insignificant from an exposure standpoint but may have been included because it is often felt important to record all exposures, especially if the extent of exposure has not been well documented. These differences would not affect medical surveillance program placement since neither 0 nor 1 exposure ratings trigger program placement under the current system.

Section 4: Other Exposure Information

The "Other Exposure Information" section asks about six specific occupational exposure factors. Of the 2917 responses, 2592 matched, resulting in 89% agreement between supervisor and QA-IH responses. Analysis of this section yielded a substantial level of total agreement with $K = 0.66$, significantly greater than would be expected by chance ($p < 0.05$). Details are shown in Tables 19 and 20.

Table 19
Supervisor and QA-IH Responses
Other Exposure Information

Occupational Exposure Factor	Supervisors		QA-IH		Disagreement*	
	Yes	No	Yes	No	Supervisors	QA-IH
Radiation Worker II	263	228	276	215	12	25
High Vibration	28	463	62	429	13	47
Licensed Pesticide Applicator	2	489	2	489	0	0
Greenhouse Work	102	389	60	431	51	9
Impermeable Clothing	117	374	102	389	47	32
Physically Stressful Environments	104	387	77	414	58	31
Total	616	2301	579	2338	181	144

* Disagreements are listed under the rater who indicated exposure.

Table 20
Supervisor and QA-IH Other Exposure Information Agreement

		QA-IH		Total
		Yes	No	
Supervisors	Yes	435	181	616
	No	144	2157	2301
Total		579	2338	2917

Sensitivity 75% Specificity 92%
Agreement 89% Kappa 0.66 P < 0.05

The largest number of disagreements in this section were related to the three questions which were designed as indicators of heat exposure: greenhouse work, impermeable clothing, and physically stressful environment. The total number of employees rated as exposed to any of the three categories by either rater is 175 employees, or 36% of the sample population. This is an indicator that heat illness risk is a concern among supervisors and employees and the level of awareness is fairly high.

Slightly over half the participants were rated as Radiation Worker 2 qualified. This seems to be perceived as an access and work task issue by many employees; however, it may also be a surrogate for radiation exposure, since employees with Radiation Worker 2 qualification would also be more likely to have radiation exposure than those who do not. However, if this information is not being currently used by the medical contractor for the purposes of determining who is or is not radiation-exposed, its presence in this section seems of limited utility. The significance of the relationship between radiation program placement and radiation exposure could be readily examined using the annual dosimetry data collected in PNNL's Radiation Exposure Monitoring System (REMS).

Two workers were rated as Licensed Pesticide Applicators by both the supervisor and QA-IH. This question, unlike the others in this category, is related primarily to a regulatory definition which is well-defined and well-recognized. Other questions in this section rely on Hanford-developed instructions and criteria, some of which are not defined in detail or are subject to interpretation. This is likely to account for most of the disagreements in this section.

Although sensitivity was low for this section (75%) and the percent agreement was only 89%, the Kappa of 0.66 showed substantial agreement, indicating that where there was agreement, it was strong.

Worker Familiarity with the EJTA Process

Not all employees were asked about their familiarity with the EJTA process, as we began asking this question at DOE-RLs request after the third contractor report. Of the 414 employees who were asked about their familiarity with the EJTA process, 291 participants (70%) had at least a basic understanding

of the EJTA process, and recalled either having seen their supervisor-completed EJTA at some time in the past, or having input into the completion of the form. The remaining 123 (30%) did not appear very familiar with either the EJTA form or process. If this smaller sample is indicative of the total Hanford population, this is a lower percent of employee familiarity with the EJTA than is consistent with proper use of the EJTA. A less than optimum employee participation rate could become a potentially significant problem with EJTA implementation. As worker familiarity with the Hanford Occupational Health Process increases, their participation in the annual EJTA renewal and JHA-based updates should improve.

RMMS and QA-MD Medical Surveillance Program Placement

One goal of the EJTA is to place workers in appropriate medical surveillance programs. Using the Risk Management Medical Surveillance system, the EJTA's completed by the supervisors were electronically analyzed and medical surveillance program placements were assigned according to the RMMS software algorithm. The QA-IH EJTA information was reviewed by a QA board-certified occupational medicine physician (QA-MD), and medical surveillance program placements were assigned manually utilizing the same criteria as the RMMS matching engine. These criteria were agreed upon by the Hanford Occupational Health Process (HOHP) Advisory Council. Where the QA-IH EJTA data did not agree with supervisor/IH EJTA, these disagreements are reflected in the QA-MD program assignment. Table 21 compares the placements.

Table 21
Supervisor-EJTA/RMMS and QA-IH EJTA/QA-MD
Medical Surveillance Program Placement Assignments

Program	Description	RMMS*	QA-MD*	Disagreements**	
				RMMS	QA-MD
AN	Acrylonitrile	0	0	0	0
ARSNC	Arsenic Inorganic	0	1	0	1
ASBCU	Asbestos	31	28	16	13
BBPP	Bloodborne Pathogens	71	62	21	12
BENZ	Benzene	0	5	0	5
BERCU	Beryllium	0	1	0	1
CAR	A1, OSHA, Other Carcinogen, specified	0	0	0	0
CDMS	Cadmium Inorganic	1	0	1	0
CRANE	Crane Operator	22	17	8	3
DBCP	DBCP	0	0	0	0
DOT	DOT Driver With CDL	25	23	3	1
ETO	Ethylene Oxide	0	0	0	0
FFR	Firefighter/HAZMAT	4	4	0	0
FORMA	Formaldehyde	0	0	0	0
FSNMT	Fissile Material Handler	28	28	5	5
HAZWS	Hazardous Waste Worker	15	1	15	1
HCP	Hearing Conservation Program	103	126	24	47
LASER	Laser Light	2	4	1	3
LEAD	Lead Inorganic, Screening	22	15	20	13
LEADS	Lead Inorganic, Surveillance	10	16	8	14
MC	Methylene Chloride	0	0	0	0
MDA	4,4-methylene dianiline (MDA)	0	0	0	0
NRCAR	Nonregulated Carcinogens, specified	0	2	0	2
PCB	PCBs	0	2	0	2
PEST	Pesticide Workers	2	2	0	0
PSAP	Personnel Security Assurance	22	23	0	1
QUAL	Quality Control Inspector	8	7	1	0
REACT	Nuclear Reactor Operator	23	18	5	0
RESP	Respirator Wearer Routine	177	143	48	14
SPO2	Hanford Patrol Security Police Officer II	6	6	0	0
SPO3	Hanford Patrol Security Police Officer III	3	3	0	0
VNLCL	Vinyl Chloride	0	0	0	0
WLDMI	Wild Mammal Handler	1	0	1	0
		0	0	0	0
Total		576	537	177	138

* Entries indicate number of placements in a medical program indicated by EJTA data. No entry in a cell means that no placements are indicated based on EJTA data.

** Disagreements are listed under the rater making the program assignment.

Based on data from the supervisor-EJTA/RMMS and QA-IH EJTA/QA-MD, the RMMS medical program placement algorithm results were compared. Overall percent agreement based on all programs for all workers (33 possible programs X 491 workers = 15888/16203 possible program placements) is 98%. There was substantial agreement between the supervisor EJTA/RMMS and QA-IH/QA-MD with Kappa of 0.71, significantly greater than would be expected by chance ($p < 0.05$). Sensitivity and specificity were calculated as 74% and 99%, respectively (Table 22). A sensitivity of 90% or greater is desirable. The low 74% sensitivity shows that some workers who may have exposures which qualify them for medical programs were not assigned to such a program. The high 99% specificity shows that most workers who were not assigned to programs were appropriately excluded, i.e., that few workers were in programs which were unnecessary.

Table 22
Supervisor-EJTA/RMMS and QA-EJTA QA-MD Medical Program Placements

		QA-IH and QA-MD		
		Yes	No	Total
Supervisors-EJTA	Yes	399	177	576
and RMMS	No	138	15489	15627
Total		537	15666	16203

Sensitivity = 74%, Specificity = 99%
Agreement 98% Kappa 0.71 P < 0.05

Discussion

General Findings

Agreement was highest for questions where the criteria for assignment were unambiguous and directly related to the major work functions, rather than exposures or activities. Agreement was poorer for questions where significant administrative factors were present in decision-making, such as questions about the need for respiratory protection, and for questions where significant professional judgment was required, such as questions about exposures. The lowest agreement was for exposure questions where agents were specified or written-in, rather than picked from a list. Due to several disagreements on exposure levels where medical programs were triggered, the RMMS program match showed that at the time of this survey, some workers were likely exposed above criteria, but were not placed in appropriate programs.

Disagreements tended to be clustered in four basic groups:

- *Disagreements due to professional judgment*
- *Disagreements due to criteria interpretation*
- *Disagreements due to administrative factors*
- *Disagreements due to an inability to predict exposures in advance*

Data quality within the EJTA appears to be highly dependent on interpretation of criteria and the application of professional judgment. Acquiring additional exposure monitoring data may improve the quality of information available and hence improve the decision process. Since the EJTA is designed to be completed by supervisors and not industrial hygienists, excellent instructions and clear criteria are needed; ongoing supervisor training will likely be needed. Several improvements have already been made, and the impact of these improvements should be tested.

Additionally, as part of an iterative, ongoing review of the HOHP, review of exposure data from a trending and analysis standpoint is needed to ensure that an acceptable quality of data is maintained and that problem areas are identified early; such review is also likely to point out areas for improved exposure assessment and ultimately the decision process for EJTA completion. We recommend that a formal, ongoing quality assurance plan involving data analysis, trending, and specific quality endpoints be developed and implemented both company-wide and Hanford site-wide. This QA should be integral to the site's ongoing Integrated Safety Management System verification plans.

A valuable public health based preventive perspective can be gained from aggregate data analysis. While little information on adverse occupational health outcomes are available for current workers because of their relatively young ages, significant information is now available through the two ongoing Hanford Former Worker projects describing latent occupational disease in Hanford workers.

The EJTA does not address historical exposures. Historical exposures are important for determining medical surveillance needs because some occupational diseases are latent, hence medical surveillance should continue after exposure ceases. There are many ways to determine and evaluate historical exposures but since the EJTA gathers information about current exposures, it may also be an ideal vehicle to gather historical exposure data.

There may need to be changes made to EJTA or alternate methods devised to accommodate the needs of project-based work such as construction and research; the EJTA is not optimized in these settings. Although there are routine components even to project-based work, which the EJTA can adequately address, the nonroutine components do not fit well within the EJTA structure and design. Since much of Hanford work is nonroutine in nature, an alternative instrument to collect exposure information, such as the JHA, is needed sitewide.

The EJTA was designed to deal with routine exposures and surveillance, not exposures which may change on a frequent but unpredictable basis or which fall outside the norm. The Automated Job Hazard Analysis was originally proposed to fill this gap, but its role has changed over time and it currently appears unable to meet these needs, particularly with regard to linking workers to exposures. The linkage of individual workers to exposure data is crucial to the EJTA, to the performance of targeted medical surveillance, and to the overall occupational health process.

Finally, we remain concerned that a significant number of employees were unfamiliar with the EJTA despite the fact that they are to review the EJTA with their supervisor and “initial” it. For the Hanford Occupational Health Process and the Integrated Safety Management System to be successful, the process and instruments used must have active employee involvement.

Limitations

There are several limitations to this study. Among the most important is the absence of a true gold standard (the absence of the knowledge of the “true” exposure status for employees) and our reliance on educated exposure estimates. Exposure estimates in the EJTA correlate directly to program placements in RMMS. To the extent that our exposure estimates may be uncertain, so also may resulting placements and sensitivity and specificity. Although it is common and accepted practice to use educated exposure estimates as a surrogate for a gold standard in many types of studies, there are uncertainties to this approach.

The study participation rate was 68%. Thirteen percent of the selected study population declined participation. Nineteen percent of the selected study population were no longer employed. Nonparticipation was spread across all employment categories, and the percentages of participants in each occupational category was relatively constant even after eliminating nonparticipants. The exact reasons for non-participation are not known, nor is the bias this deficiency produces in our data.

Another possible limitation is that the overall database of employees from which the study population was drawn, thought to represent the entire Hanford worker population, may not include all workers. This becomes especially problematic if those workers not included have different exposures (type, frequency, magnitude) than do those who are included.

Conclusions

A summary of percent agreement and other statistical parameters is shown in Table 24.

Table 24
Summary of Statistics by EJTA Section

Section of EJTA	Percent Agreement	Kappa	Sensitivity	Specificity
Physical Job Requirements	68%	0.53	NA	NA
Medical Qualification Examinations	97%	0.77	81%	98%
Potential Exposure Hazards, Listed	91%	0.46	NA	NA
Potential Exposure Hazards, Write In	90%	0.16	NA	NA
Other Exposure Information	89%	0.66	75%	92%
RMMS Assignment	98%	0.71	74%	99%

NA = Not Applicable

For the EJTA sections evaluated in this assessment, percent agreement ranged from 68% to 98%. The Kappa statistic ranged from a low of 0.16, indicating only slight agreement, in the write-in Potential Exposure Hazards section to a high of 0.77, indicating substantial agreement, in the Medical Qualification Examinations sections. A Kappa value of 0.50 or greater is generally considered adequate for instrument testing purposes⁴; sections of the EJTA in which Kappa of 0.50 or greater were *not* achieved were the Potential Exposure Hazards section, both for listed and write-in agents. This means that the levels of agreement between supervisor and QA-IH EJTA's were lower than desirable and that data quality for these sections may be questionable. Ongoing QA is particularly important in this area.

Based on standard surveillance practice, a sensitivity of 90% or greater was the goal set by the HOHP Advisory Council because of the anticipated difficulties in achieving the final goal of 100. Sensitivity did not reach the 90% goal in any of the three sections for which sensitivity and specificity could be calculated (Medical Qualification Examinations, Other Exposure Information, and RMMS assignment). The 74% sensitivity for RMMS assignment means that some workers (138 of 537) who may have exposures which qualify them for medical programs were not assigned to such a program. Specificities were uniformly above 90%, showing that most workers who were not assigned to programs were appropriately excluded, i.e., that few workers were in programs which were unnecessary.

The Hanford Occupational Health Process has a significant achievement in the EJTA system and accompanying Risk Management Medical Surveillance system (RMMS). For the first time the majority of Hanford workers (over 12,000) are tracked and assigned to medical monitoring programs based upon risk instead of strict administrative assignments. Hundreds of useless exams have been eliminated. Population based analysis of hazards and medical outcomes is now possible. A potential liability remains however. The sensitivity of 74% for the RMMS match to medical program is lower than desired. This finding suggests that workers who are potentially exposed are not always assigned to a medical program. While at a complex site like Hanford 100% sensitivity for this measure is very challenging to achieve, it should remain the goal of the program. Acceptance of less than 100% sensitivity should depend upon the specific risk posed by the hazard and any positive findings in medical surveillance related to hazards. The EJTA has promise as an instrument to monitor worker hazards and direct medical surveillance. Many improvements have already been made, particularly in the help screens and criteria for qualitative exposure assessment and job tasks. Better coverage both for non-routine jobs and sub-sub-contractor

⁴ Kramer MS, Feinstein AR (1981) Clinical Pharmacologic Therapeutics, Vol 29:111-123. Clinical Biostatistics. LIV. The biostatistics of concordance.

workers is needed along with qualitative exposure assessment and full worker participation. Ongoing evaluation of the system will be required to determine if these improvements have worked.

Recommendations

The following recommendations were discussed in individual sections and are summarized below.

1. An accurate site roster is clearly needed to assure that all workers were included in this crucial health and safety program. The absence of such data leaves the contractor open to liability from workers who may have significant exposures who were not accounted for, and who were possibly excluded from medical monitoring.
2. We recommend that a formal, ongoing quality assurance plan involving data analysis, trending, and specific quality endpoints be developed and implemented on a company- and Hanford-wide basis.
3. RMMS data should be used in aggregate to help direct workplace hazard reduction. It should contribute to the metrics of the site-wide Integrated Safety Management System. Medical outcome data from the two Hanford Former Worker Programs should be used to prioritize exposure assessment and hazard reduction.
4. The level of employee participation in EJTA completion was lower than desirable, and needs to be improved.
5. We recommend that another method be developed for tracking nonroutine exposures in research, construction, and other dynamic, project-based settings.
6. Consideration should be given to developing a rating scale or other method for indicating the presence of potential dermal exposures.
7. Consideration should be given to additional medical programs, such as for ergonomic and particulate hazards. Consideration should be given to the carcinogen program to enable triggers based upon multiple non-OSHA regulated carcinogen exposures.
8. In light of the poor performance of the 'Physical Job Requirements' section, and the pending ergonomic standard, an improved measure for ergonomic hazards is needed.
9. Help screens for "Other Exposure" information need improved clarity and/or training. Improved communication with workers should also assist in this area.
10. Radiation exposure could be readily examined using the annual dosimetry data collected in PNNL's Radiation Exposure Monitoring System (REMS), added to the medical record and used to assist in accurate program placement for the "Other Exposure" section.
11. Classification of routine and nonroutine respirator use seems to pose difficulties. A review of these classification criteria may be helpful to assure that workers receive the necessary qualification.
12. Analysis of the Medical Qualification section showed that there appear to be a substantial number of workers enrolled in the Bloodborne Pathogens who may not need this program. Review of classifications for this program may be in order.
13. Exposure questions for which criteria appear to need further development include laser light, asbestos, and lead.

Appendix A
Revised Employee Job Task Analysis Quality Assessment Plan

Employee Job Task Analysis Quality Assessment Plan

**TULANE UNIVERSITY
UNIVERSITY OF WASHINGTON**

Draft 3/4/97

Revised 4/18/97

Revised 3/10/98

This quality assessment plan is a joint effort of the University of Washington and Tulane University. The quality assessment effort is a multi-tiered plan that includes an assessment of 1) the quality of potential exposure information and other information collected by the EJTA, 2) the quality of medical monitoring program placement by the RMMS system, and 3) the quality of training information collected by the EJTA and disseminated by the RMMS. Section one of this plan focuses on the first of these tasks, the evaluation of potential exposure information collected by the EJTA. Sections two and three will discuss the second and third tasks, respectively.

Quality Assessment Plan Part 1 - Evaluation of Information Collected by the EJTA

I. Introduction

The Hanford Occupational Health Process (HOHP) is a Hanford multi-contractor effort to link work planning, hazard identification, exposure monitoring, and occupational medicine in a logical and systematic manner. Employee specific task and hazard data would be linked to the occupational medical contractor via the Risk Management Medical Surveillance (RMMS) software, currently under development. Coordination and linkage of information would allow population-based data analysis and tracking, in addition to enhancing efforts aimed at ensuring individual employee safety and health.

Among the information sources which will be utilized in the HOHP is the Employee Job Task Analysis (EJTA), which gathers information about an individual employee's work, including physical requirements of the job, potential or actual exposure hazards, and training requirements. Information contained in the EJTA will be used to make decisions about placement in medical surveillance programs. This plan describes a method of assessing the quality of exposure and other data collected by the EJTA instrument.

II. Goals of the Evaluation of the Employee Job Task Analysis

A. Determine how well the EJTA compares to a best estimate of true exposure potential.

The information collected by the EJTA must accurately reflect the hazards, or potential hazards, to which an individual worker is exposed. Since the "true" condition of exposure or potential exposure for each employee is not known, it must be estimated. If the true situation was known, the evaluation process could determine how well the EJTA identifies the presence of an exposure or condition when it is truly present (sensitivity) and how reliably the EJTA classifies the absence of an exposure or condition when it is not present (specificity). Instead, the evaluation process will compare agreement between the information collected by the EJTA and an educated estimate of employee exposure. Measures of sensitivity and specificity can still be computed, however, their interpretation requires the assumption that the estimate made by the evaluation team industrial hygienist represents the true situation for each employee.

If information gathered by the EJTA does not meet pre-determined acceptable levels of agreement, further

evaluation of the reasons for disagreement may be needed. Disagreement between the EJTA and the evaluation team IH may be an indication that conclusions drawn from the data may be incorrect, and actions taken in response to the EJTA (e.g. medical surveillance program placement) may be inappropriate. Specific areas of disagreement will be further examined in a qualitative manner.

B. Determine whether and how well the EJTA collects the information necessary to determine medical placement/surveillance.

The EJTA must contain sufficient data about the employee's work for the occupational physician and industrial hygienist to make initial decisions about job placement and medical surveillance. While it is anticipated that the current EJTA may be satisfactory in that regard, the use of the EJTA for this purpose has not been tested in actual practice. For instance, the EJTA may identify some unanticipated exposures, and it is possible that questions on the EJTA may not provide enough information to determine if surveillance is needed for these exposures. This evaluation of the EJTA may suggest areas for future revisions and appendices to the instrument, to more thoroughly characterize employees' potential for exposure.

C. Determine whether the EJTA works equally well for different types of work activities and populations.

There is a wide variety of work conducted at Hanford, ranging from administrative and technical to heavy construction. Quality assessment should be conducted in such a way as to ensure that the entire spectrum of work activities and worker exposures at Hanford are represented. This will ensure that the instrument will provide accurate information when used in different work environments, and that the work activities and potential exposures of employees in many different occupations and work settings can be adequately described using the EJTA.

It is essential that when selecting populations for evaluation studies, the entire population be included for the purposes of having a truly representative sample population, rather than selecting certain work groups or workers for inclusion and excluding others. Exclusion of some workers may result in inappropriate conclusions being drawn from final data. For example, multiple layers of subcontractors could easily be missed, as could mobile workers who work intermittently at a variety of work sites. These are some of the most challenging environments in which to implement the EJTA and to complete evaluation studies, due to the mobility of workers and the transient, project-based nature of the work. However, it is possible that these workers could have highly significant workplace exposures. Eliminating these workers from quality assessment studies would mean that the EJTA would not have been tested under its most challenging conditions and therefore may not function as intended in these settings.

III. Methods for the Evaluation of the Employee Job Task Analysis

EJTAs for all workers at the designated locations will be filled out by contractor supervisors and industrial hygienists. A randomly selected set of employees that have exposures representative of the working population targeted by medical surveillance systems will have an additional EJTA filled out by the assessment team. The supervisor-completed and assessment team-completed EJTA will be compared for agreement. Items where substantial disagreement was found would be examined more closely to determine the causes for disagreement. A technical report of methods and findings will be written.

A. Identification of Population

Ideally, the evaluation process would include workers at enough locations to be representative of most jobs at Hanford. This would include construction; maintenance and operations of nuclear processing facilities; environmental restoration; research; and decontamination and decommissioning (D & D) of old facilities. This would include all major site contractors and be extended to subcontractors.

The population for conducting the initial quality assessment study will be limited to Fluor Daniel Hanford (FDH) and its major subcontractor and enterprise company employees. The facilities which are managed by

FDH and at which its employees work are West and East Tank Farms, K Basins, the Plutonium Finishing Plant (PFP), and Solid Waste. FDH, subcontractors, and enterprise companies completed EJTA's for all employees in their organizations during 1997. These contractors include FDH, Lockheed Martin Hanford, Duke Engineering, and Waste Management Hanford, among others. The quality assessment plan focuses on company rather than location. If all FDH companies and other prime contractors are represented in the plan, the full spectrum of work activities conducted by these contractors should be represented. This would not include some functions such as environmental restoration and research, which are conducted by other prime contractors. Quality assessment for Bechtel Hanford Company and Pacific Northwest National Laboratory will be conducted at a later date.

Hanford Environmental Health Foundation was the first organization to complete all of its EJTA's. Therefore, quality assessment will be conducted on a sample of EJTA's from this contractor first.

Proper selection of the population is essential to defining and assessing outcomes for the evaluation. As noted earlier, the entire population of the company including subcontractors, administrative staff, and transient workers, should be included in initial EJTA completion. The study population should represent all workers within the selected company at which EJTA's are to be completed.

Identifying all workers within a company at a specific time may be difficult due to the number of employees currently being transferred between FDH major subcontractors and enterprise companies. It should be determined whether the identified workers are indeed the entire population, or whether certain groups or individuals have been missed. Since only FDH and affiliated employees will be included, it will be important to determine how FDH and affiliated contractor employees' work differs from the work of other contractor employees. Reasons for non-identification should be noted.

A limitation to this study is the restricted population to draw a sample from. As discussed above, selection bias is probable when the sample is drawn from a population which excludes some groups of workers. An estimate of selection bias will be made by comparing the population drawn from to the most complete worker data sets available. If the worker groups not sampled from have similar exposures this selection bias would not be an issue. Thus comparing exposure in a sample of workers not originally sampled from to existing samples would provide an estimate of the selection bias.

B. Sample Selection

Sample sizes will be calculated by a study team epidemiologist independently for each contractor, subcontractor, or enterprise organization participating in the quality assessment. The sample size will be computed using the formula for a cross-sectional survey and the parameters used will be chosen to maximize precision. Each contractor will be asked to provide a Common Occupational Classification System (COCS) code for each of its employees. A stratified random sampling scheme will be utilized to ensure that each COCS code is adequately represented in the sample. Sampling weights will be applied to each of the COCS codes, and these will reflect the proportion of the total population of employees in each code. In some instances, the weights will be disproportionately applied to the COCS codes to increase the sample taken from groups which are determined to be of more interest, and decrease the sample taken from groups which are determined to be of less interest. These sampling weights will then be applied to each group, characterized by COCS codes, to determine the proportion of the total sample size required from each group.

COCS codes are included in the EJTA. These codes are standardized Hanford job categories, and each employee is assigned to a specific COCS code. A distribution of COCS codes at each FDH major subcontractor and enterprise company will be provided by the various human resources departments. Based on that distribution of COCS codes, sampling numbers will be determined for each COCS code within each company in order to achieve a representative sample.

It is likely that not all workers selected for participation will be able or willing to participate in this study. If workers could not or did not wish to participate, the reasons should be noted and an analysis made of any bias introduced by non-participation.

(Note: All resource information is moved to the end)

C. Assessment of Standardization of EJTA Training and Administration

Training in and administration of the EJTA are important parts of the EJTA implementation process but are not part of the assessment plan, and are the responsibility of the implementing contractor. Tulane University will provide observation and evaluation of the training process, to be conducted by a staff member experienced in the evaluation of training. This information will be used to assess possible sources of error that may affect study results.

D. Field Exposure Evaluation Activities

For each EJTA selected to be part of the study, a field exposure evaluation will be conducted by an assessment team industrial hygienist, and a second EJTA filled out. These exposure evaluations will be conducted in a blinded fashion; that is, the industrial hygienist filling out the second EJTA will not have access to the initial EJTA. The proposed method for conducting the field exposure evaluations is described below.

1. Recruitment of employees to be included in validation

Based upon the selection strategy outlined above, the name, work location, job title, and organizational affiliation would be provided to the assessment study team by the epidemiologists carrying out the sampling strategy. The assessment team will provide information to contractor management on the quality assessment process and the names of selected employees and their managers. The contractor will provide general information about the process to the selected employees and their management. If a selected employee does not wish to participate, their name will be marked as a non-participant on the list, and they will not be contacted further.

2. Obtaining signed employee consent

A signed consent form will be obtained for each employee who agrees to participate in the validation study fulfilling the requirements of local and UW Institutional Review Boards. The consent form would be signed at the time of the employee interview.

A short interview will be conducted with each employee. The purpose of the interview is to determine the physical job requirements, types of work performed, materials used, frequency and duration of potential exposures, and other workplace exposure information. It will be conducted using a semi-structured questionnaire. The information gathered in the interview will be used in conjunction with other information sources, detailed below, to determine the employee's potential exposures.

4. Review of employee exposure records

Individual exposure records would be reviewed for each employee to corroborate potential exposure information and to provide additional information on exposure frequency and duration. In addition, any exposure records available for workers who conduct work similar to that of the employee will be reviewed to determine if any potential exposures in the group could be extrapolated to the employee.

5. Review of general workplace documents

Relevant information pertaining to the workplace will be reviewed to provide general background on the common exposures and work patterns in that environment. This could include health and safety reviews, process documentation, and other related documents

6. Work site evaluations

A general work site evaluation of the work area will be performed if possible. A specific work site evaluation for each employee will be performed if it appears that significant additional information would be gained by such an evaluation and if the employee has a specific, rather than general, work area

7. Exposure monitoring

Exposure monitoring might be performed to assist with making exposure judgments for a selected few employees. This would be particularly useful if existing data appeared insufficient to make determinations of potential exposures. Such cases will likely be rare and criteria would be set to determine when exposure monitoring was needed. One suggested criteria is to conduct exposure monitoring only if there were no individual employee exposure records, no group employee records, no pertinent facility data on materials and usage, and if the materials of interest were outside the scope of normal work for a given job, and of such a unique nature that no information was available in the literature about expected exposure levels in the tasks of interest. Stringent criteria will minimize delays, cost, and work disruption while maximizing the use of professional judgment, which is a crucial component of the characterization of potential exposures for the EJTA.

8. Reliability

To address the issue of intra-rater reliability, a supervisors completing EJTA's will be asked to complete a second EJTA for certain employees after three to four weeks. The selection of employees to have a second EJTA filled out will be based on a convenience sample of employees still working in the same capacity as when the original EJTA was completed. This section of the QA plan will occur separately from the employee interview and analysis component, and will be carried out at a later date to be determined.

9. Documentation

A documentation file will be completed for each step of the process for each worker. Checklists and other standard documents which allow for review and reproducibility of data are desirable and will be used in each step of the exposure evaluation process whenever possible. Information contained in this documentation file will be handled as would any other medical record, with full confidentiality protected.

10. Completion of the EJTA form

After performing the above steps, the assessment team IH will review the data and will complete an EJTA form for each employee in the sample.

E. Data Analysis and Reporting

(Note: UW will keep personal identifiers in a separate locked file. TU may not have this requirement.

The EJTA completed by the supervisors will be compared to that completed by the study team industrial hygienists. Responses by the assessment team IH will be cross-tabulated with the responses from the employee supervisor for each item of interest on the EJTA. Agreement will be assessed by observing the proportion of responses falling on the diagonal line of cells from the upper left to the lower right of the table. Disagreement will be represented by the proportion of responses contained in off-diagonal cells, and the direction and magnitude of disagreement will be indicated by the location of those cells. See Table 1. The diagonal formed by the concordant cells indicates agreement. Each of the other cells indicates disagreement with the cells distance from the diagonal indicating magnitude of disagreement on the ordinal scale. Each number within the cells represents individual employees, and the percentage is the proportion of the total sample contained within the given cell. In this example there is a total of 80% agreement between the IH and the employee supervisor, because 36 of 45 employees are contained within the concordant cells, indicating that both the IH rating and the supervisor rating for potential exposure to asbestos agree for these 36 employees. However, the potential for exposure to asbestos was characterized differently by the two raters for nine of the employees. For one of these nine, the industrial hygienist rated the potential for exposure a "one" while the supervisor gave it a four. In addition to allowing the assessment team members to evaluate overall agreement, this method also allows the assessment of magnitude and direction of disagreement. This will contribute to the identification of possible sources for the discordant responses by the IH and employee supervisor.

For dichotomous measures, including placement in a monitoring program, the sensitivity and specificity will be calculated. Interpretation of these measures forces the assumption that the assessment by the study team IH represents the true potential for exposure of each employee, and therefore must be made with caution. Ordinal

measures will be compared using a weighted kappa.

For reliability analysis of supervisor repeated and QA-IH repeated EJTAs Kappa will be used.

It should be emphasized that there is a second, less quantitative part of data analysis. This consists of a team discussion regarding the interpretation of the statistical results. The team will need to discuss the findings and reach some agreement about exactly what the findings mean from a worker health and safety standpoint. Areas of disagreement between original and study EJTA must be evaluated to determine the cause of the disagreement, since there could be many reasons for such disagreements.

A preliminary report will be provided to DOE-RL within two months of the completion of each company's sample set. This report would fully describe the methods and results of the assessment. A final report to include analysis of all EJTAs as a group, in addition to analysis by separate company, will be provided within six months after the assessment for all sampled EJTAs is completed.

Table 1. Hypothetical example of cross-tabulation to be used to assess agreement between assessment team IH and employee supervisor.

Asbestos			Industrial Hygienist				Total
			1	2	3	4	
Supervisor	1	Count	15				15
		% of Total	33.3				33.3
	2	Count	1	12	3		16
		% of Total	2.2	26.7	6.7		35.6
	3	Count		2	8	1	11
		% of Total		4.4	17.8	2.2	24.4
	4	Count	1		1	1	3
		% of Total	2.2		2.2	2.2	6.7
Total		Count	17	14	12	2	45
		% of Total	37.8	31.1	26.7	4.4	100.0

Quality Assessment Plan Part 2 - Evaluation of RMMS Program Placement

A separate validation plan has been written for the evaluation of RMMS program placement.

Draft 7Jan. 98

I. Introduction

An integral part of the Hanford Occupational Health Process (HOHP) is the Risk Management Medical Surveillance (RMMS) system. The RMMS system is designed to provide an interface for the Employee Job Task Analysis (EJTA) Database, Sentry Industrial Hygiene Database, and Hanford Scheduling System (HSS), place employees in medical surveillance programs based on hazard data from the EJTA and Sentry Databases; and generate reports which facilitate population based analysis for illness and injury preventive interventions.

The software testing strategy involves functional testing of individual components and the composite package in order to provide assurance that all aspects of the RMMS function as designed. This testing includes the quality of inter-process communication, interaction with databases, and process responses and times. The testing strategy will demonstrate that the RMMS does what it is designed and programmed to do. This type of plan does not demonstrate that the design specifications and requirements of the system are correct, only that the system does what it is told to do.

The most important function of the RMMS is proper risk-based assignment to medical monitoring programs. This aspect of the RMMS is not included in routine software acceptance testing. The proper placement of workers into medical surveillance programs includes two major areas which must be validated and tested: the criteria for placement, and the outcome of the assignment process.

Validating the criteria for placement will ensure that the proper placement criteria are being used by the RMMS system. Validating the outcome of the assignment process will ensure that the RMMS system is consistently placing workers in the correct programs under field conditions.

II. Details of RMMS Validation Process

A. Validation of Placement Criteria

The criteria for placement are being developed independently by a team of University of Washington and Hanford Environmental Health Foundation Occupational Medicine physicians and . These criteria will be compared to the criteria currently in place at Hanford. In the event of discrepancy, the reasons for differences in criteria will be discussed and a consensus reached as to the proper criteria to be used.

Some placement criteria are defined by regulation. These will be relatively easy to interpret and establish as placement criteria. When criteria are not prescribed by regulation, there is variability in what might be considered appropriate screening criteria. Non-regulatory placement criteria should be developed based on the current state of knowledge in occupational medicine, considering available monitoring techniques, the specificity and sensitivity of those tests, and the utility and outcomes of such testing in the workplace and for the individual worker's health.

B. Validation of RMMS Placement Outcomes

Validation of RMMS placement outcomes will establish that the RMMS system is using the placement criteria as intended, and that employees are being placed in the proper program. The "proper program" would best be defined as the program into which the criteria direct placement. In all cases RMMS placement should agree with the placement decision which would be made by a team of competent occupational physicians and industrial hygienists, based on available data and using the same set of placement criteria.

The EJTA validation process will include the first step in the process of validating RMMS placement outcomes. After the study EJTA is completed, the industrial hygiene and occupational medicine members of the assessment team will discuss the data and determine what medical surveillance programs the employee should

be placed in, using the pre-established placement criteria. The exposure determinations and criteria used to make the placement decision will be documented.

After the RMMS system processes the EJTA data and places the employee into the proper medical surveillance programs, the placement decisions of RMMS and assessment team will be compared for agreement. Since identical EJTA data and placement criteria will be used by both the assessment team and the RMMS, in theory there should be no disagreement in placement if the RMMS system is functioning properly and the assessment team has correctly applied the placement criteria. Discrepancies between the RMMS and assessment team placement decisions would be closely examined to determine why there was a difference.

Employee confidentiality would be protected during the comparison phase by the use of unique coded identification numbers, such as those used during the EJTA assessment process. Persons discussing the comparisons would not know the name or other personal identifiers of employees in the RMMS placement study.

Analysis would consist of comparisons of the physician and industrial hygienist medical monitoring assignment ("gold standard") with the RMMS computer driven assignment. Sensitivity and specificity calculations will be made for each program. Similar analysis is possible for individual hazards.

Quality Assessment Plan Part 3 - Evaluation of Training Information

Part 3 consists of an assessment of the quality of the training information obtained by the EJTA will be performed by Tulane University in a separate study. When completed, it will contribute to the overall Quality Assessment of the utility of the EJTA.

I. Introduction

The term “training” as it applies to the Employee Job Task Analysis (EJTA) refers to two independent concepts, each of which will be evaluated in terms of the quality of information provided. The first of these concepts refers to the training of contractor and sub-contractor industrial hygienists and employee supervisors regarding the proper completion of the EJTA. Quality assessment of this component is covered in section II below. The second refers to the information collected by the EJTA regarding occupational training required of employees to perform their jobs. This will be addressed in section III below. Hammer/Tulane will be responsible for completing this component of the Quality Assessment.

II. Assessment of EJTA Training

To accomplish the goal of site-wide implementation of the EJTA, persons at Hanford responsible for completing the forms must be trained as to the proper manner of doing so. Employee supervisors and industrial hygienists (IH) employed by Hanford contractors and sub-contractors are currently being trained regarding the use and completion of the (EJTA). These employees will be primarily responsible for completing EJTA's for each of their employees, and their understanding of both the mechanics of the form and the reason for its existence has the potential to impact the quality of the information collected by the EJTA. For this reason, one component of the EJTA Quality Assessment Plan is to evaluate the training provided to these contractor and sub-contractor supervisors and IHs. Enhanced Work Planning (EWP) team members who have been involved in the development of the EJTA, and who are fluent in its application, have designed a two-hour seminar for educating these contractor employees in the correct way to complete the EJTA. Training is conducted separately for each contractor, and, depending on the number of employees to be trained, may consist of more than one seminar. Any differences in the way these training courses are conducted between contractors/sub-contractors could potentially contribute to differences observed between contractors/sub-contractors in terms of the quality of the information collected by the EJTA. In assessing the quality of information obtained by the EJTA, then, the potential for the impact of the training course must be taken into consideration. To do this, certain characteristics of the training courses must be assessed.

A. Methods

EJTA training courses will be assessed by Tulane University-Hammer personnel who are experienced in the evaluation of education/training programs. A sample of training courses will be attended by one of two Hammer employees who will make a qualitative assessment of the course based on a series of pre-determined items. The observers will subjectively score four of these items for each course they attend. In addition, one summary measure reflecting the consistency of the quality of all of the courses attended by these observers will be provided. The characteristics to be assessed in the evaluation of EJTA training are:

1. *Standardization of the Presentation:* This includes how well the instructors follow the outline of their presentation, whether they make each of the points stated in the outline, and the clarity with which they present the information. If the instructors omit an item or items from their presentation, the specific item is noted as having been omitted.
2. *Participation:* This includes whether the instructors encourage student participation as well as whether or not the students do participate.
3. *Feedback:* Solicited or unsolicited feedback from students including but not limited to their opinion of the utility of the EJTA.
4. *Demonstration of Understanding:* An assessment is made as to whether students demonstrate an understanding of the application of the EJTA.
5. *Consistency:* Finally, the consistency of the quality of the training courses, as measured by the

above items, across training courses, will be assessed.

Following attendance of the last selected training course, a report will be generated which will summarize the qualitative assessments made of EJTA training courses, as well as the composite estimate of consistency. It is possible that the overall EJTA Quality Assessment will find inconsistencies between contractors with respect to the quality of data collected by the EJTA. This a priori evaluation of the EJTA training courses will help rule out the training courses as likely sources of any inconsistencies observed. Many of the EJTA training seminars had been completed prior to beginning this phase of the Quality Assessment. Consequently, the results of this assessment reflect the quality of information provided only to those contractors who had not yet received training at the time that this assessment was begun. These results may not reflect the quality of training provided to contractors who had completed training for the EJTA prior to the start of this part of the Quality Assessment.

III. Assessment of Occupational Training Requirements Collected by the EJTA

In the same way that the employee supervisor/IH filling out the EJTA is asked to indicate the potential exposure hazards for each employee, (s)he is asked to indicate the training that is *required* of the employee. The decision of whether training is required should be made based upon items in other sections of the EJTA, such as Physical Job Requirements, Medical Qualifications, and Potential Exposure Hazards. These other sections of the EJTA to which training selections are linked are hereafter referred to as predictor items as they are related to training. Any training course indicated as required on the EJTA should reflect the employee's work environment and responsibilities as identified by the predictor items elsewhere on the form. In terms of training, the information provided by the EJTA will be used to plan for future training, to allocate resources for training based upon anticipated enrollment, and to determine whether employees are receiving appropriate training. The importance of these issues requires that the quality of data provided by the EJTA be evaluated.

A. Identification of Population

The assessment of the quality of information provided by supervisors and industrial hygienists on the training section of the EJTA will be conducted on the same sample of employees on whom the overall Quality Assessment is conducted. A sample of EJTA's will be selected from each contractor/sub-contractor according to the plan described in Part 1, Section III-A of this Quality Assessment Plan. The quality of this data will be evaluated using the methods outlined below.

B. Methods

The quality of information collected by the Training section of the EJTA will be assessed in a number of ways. Methods of evaluating internal consistency, comparison with external sources of actual training enrollment, and data from the Quality Assessment team work-site evaluations and exposure monitoring will all be used to assess the quality of the information provided by the Training Categories section of the EJTA.

1. *Internal Consistency*

Internal consistency will be appraised by comparing the training course requirements indicated in the Training Categories section of the EJTA with the employee's corresponding predictor items in the Physical Job Requirements section, Medical Qualifications section, and Potential Exposure Hazards section of the form. Each training course indicated as required for an individual employee must reflect the status of the corresponding predictor item to be internally consistent. Conversely, if the training course is indicated as not being required, this should also be reflected by the predictor item.

Agreement between the indication of training course requirement and the associated predictor item will be assessed in much the same manner as explained in Part 1 section III-D above. Each training course will be assigned a value of '0' if it is not required and '1' if it is indicated as being required. Similarly, each predictor item will be assigned a value of '0' if the value assigned would not indicate a training requirement and '1' if the value assigned would indicate a training requirement. A 2 X 2 table will be constructed and agreement will be

assessed by observing the proportion of observations falling in the concordant cells. Percentage of disagreement will be indicated by the proportion of observations in the discordant cells.

An interpretation of this component of the assessment requires the assumption that the information provided in the Physical Job Requirement section, the Medical Qualifications section, and the Potential Exposure Hazards section of the EJTA is valid to determine that the Training data is *accurate*. The term *accurate* refers to the ability of the data to reflect the *true* training requirements of each employee. However, since the training requirements are keyed directly off of these other sections, regardless of their validity, it is possible to assess the consistency between the training section and the predictor items without making an assumption about the validity of the predictor items. For instance, an employee may have a ‘3’ for asbestos even though, in reality, (s)he should have a ‘1’. We can assess the internal consistency of the form based on the assumption that ‘3’ is correct, although it may not reflect the employee’s true situation. We know that the employee should have some type of asbestos training based strictly on the PEH form, regardless of whether the PEH form is correct, and we can make an assessment of the consistency between *indicated* asbestos training and *indicated* exposure to asbestos for this employee.

2. Comparison of EJTA Training Data with External Sources of Training Information

Currently, the People Soft database and the TMX database contain information regarding employees’ training. The People Soft database includes data pertaining to whether a course has been completed by an employee, the date the employee completed it, the date on which it becomes due, and specific course information. The TMX database holds information concerning requirements for training based on the employee’s position, whether or not the training is mandated by law, directed by orders or directives, provides professional enhancement but is not mandated or directed, or is needed to maintain operator certification. In addition, TMX is capable of providing reports regarding the training requirements of a given “position”, the training courses completed by an individual, training courses for which employees are delinquent, and training required to be taken within the approaching 90 days by an individual. Training data from the EJTA can be compared with the data from these two databases to determine whether the training courses identified as required by the EJTA are also required according to the TMX database and whether employees are up to date on training courses indicated as required by the EJTA.

Again, proportion of agreement between the two sources of information will be assessed by arranging the data in a 2X2 table. The columns will indicate whether the training course in question is required by the TMX while the rows will indicate the requirement based on the EJTA. Cells *a* and *d* are the concordant cells and represent agreement between the two sources of information, while cell *b* and *c* represent disagreement between the two sources, (see Table 2). A second 2X2 table will be constructed to assess whether the required training data collected by the EJTA agrees with the employee’s record of having completed the course, (see Table 3).

The evaluation of these tables will be primarily qualitative in nature. Proportion of agreement and disagreement will be determined, and decisions will be made to further examine the reasons for disagreement based on the magnitude and perceived importance thereof.

Table 2. Assessment of agreement between TMX and the EJTA in designating a training course as required for individual employees.

<u>EJTA Training Required</u>		<u>TMX Training Required</u>	
		Yes	No
Yes		<i>a</i>	<i>b</i>
No		<i>c</i>	<i>d</i>

Table 3. Assessment of agreement between whether the employee had completed the training and whether the EJTA indicated that training was required.

Employee Completed Training

<u>EJTA Training Required</u>		Yes	No
	Yes	<i>a</i>	<i>b</i>
	No	<i>c</i>	<i>d</i>

3. *Comparison of EJTA Training Data with QA Team Field Exposure Evaluations*

As explained in Part 1 Section III-C of this QA plan, the QA IH will conduct employee interviews, review employee exposure records, review general work-place documents, perform work-site evaluations, and, on occasion, may perform exposure monitoring. The data collected through these activities will be used, if necessary, to make an assessment of the quality of the training data collected by the EJTA. The training requirements identified by the EJTA will be compared with the field exposure data to determine if the employee's work environment, as determined by the QA IH, is consistent with the training requirements. This method of assessment will be used only in the event that the QA methods described above do not provide sufficient information to draw conclusions about the quality of training data collected by the EJTA.

Appendix A. Resource Requirements

B. Sample Selection

Resource Requirement: FDH, HEHF, Bechtel, and other contractors would need to provide an exposure classification for all COCS codes. This has been done. The RMMS database contains all information needed for sample selection and will be used for that purpose. Data from the RMMS database will be provided by HEHF.

C. Assessment of Standardization of EJTA Training and Administration

Resource Requirement: FDH continues with EJTA implementation program as planned, advising assessment team in advance on the schedule and location of training sessions. A copy of the training outline has been provided by FDH, along with the names of persons to contact regarding the training schedule.

1. Recruitment of employees to be included in validation

Resource Requirement: Contractor management will be provided with sample selection lists and will need to update the lists with regard to current managers, company affiliation, unit affiliation, and work status (working, quit, leave, etc). The manager will receive an electronic mail message describing the project and their needed involvement, and a confirmatory phone call prior to their employee's interview. Selected employees may receive an informative electronic mail message and/or a brief phone call

2. Obtaining signed employee consent

Resource requirement same as for 3., below.

3. Employee interviews

Resource Requirement: It is anticipated that the interview would require one hour or less of the employee's time. The interview would be conducted at a location convenient to the employee and employer and would likely be at the employee's regular workplace or in a nearby location such as a conference room or office, especially if the employee works in a limited access area. The interview would be scheduled at the employer's convenience during regular working hours. Supervisors would need to be informed by FDH ahead of time that a few of their workers might need to spend one hour of a workday in an interview, and would need to identify locations and times for the interviews to be conducted.

4. Review of employee exposure records

Resource Requirement: A suitable search program within the Sentry database already exists. If access to the program can be made during regular working hours at the Sentry database administration office, the study team will perform the searches and obtain the records. This should not require more than a few hours of computer access.

5. Review of general workplace documents

Resource Requirement: FDH would need to provide access to pertinent documents. FDH major subcontractor and enterprise company personnel would be asked to make suggestions about the best documents to review. Documents would be reviewed by the study team at the location where the documents are kept. This should not require more than one to two hours of any person's time at each facility.

6. Work Site Evaluations

Resource Requirement: An employee or supervisor would be needed to accompany the study team members

on a walkthrough of the work area. The time required would depend on the size of the facility or portions of the facility which needed to be reviewed. It is anticipated that the time requirement would be 4 hours of escorted time at the maximum, and likely less. In many cases facility tours would not be helpful due to the mobile nature of much Hanford work, and would not need to be conducted. Facility staff would need to specify any entry requirements. Costs for study team member training, medical surveillance, or other entry requirements would be paid by the study teams.

7. Exposure monitoring

Resource Requirement: The study team members would provide sampling equipment and analysis. If desired by the contractor, FDH sampling equipment or analysis could be used.

8. Reliability

Resource Requirement: Supervisors would need to spend approximately one hour completing a second EJTA for each selected employee and reviewing it with the employee, if this section of the QA plan is implemented in the future.

9. Documentation

Resource Requirement: No contractor resources required.

10. Completion of the EJTA form

Resource Requirement: No contractor resources required.

Appendix B
EJTA Interview Guide and Note Sheet

Worker Interview Guide
EJTA Quality Assurance Project

1. Find a private, quiet location.
2. Provide an overview of the QA project - purposes, methods, etc.
3. Review consent form with employee. Answer any questions. Obtain signature on consent form.
4. Ask employee for the following demographic information: full name, Hanford ID number or payroll number (explain that this will be used only as a positive identity match); employer (primary and matrix); work location (building, area); shift assignment, job title. Record on EJTA form.
5. The interview questions are open-ended. The goal of the interview is to learn the nature of the employee's work, determine potential exposures to hazardous chemicals or other agents, so that an EJTA can be completed for each employee. Follow the EJTA help screen printouts for guidance in completing specific questions on the EJTA. Do not attempt to determine the employee's essential functions; this part of the EJTA does not need to be filled out. Use the attached note sheet to record interview information. The following are examples of the types of questions to be asked during the interview:

Please describe in detail the kind of work you do.

What chemicals do you use in your work?

How often do you use those chemicals? (hours/day, days/week, weeks/year)

How is the chemical used, and how much is used?

What personal protective equipment is used with each task/chemical?

Have you ever worn a sampling pump or other device to measure your exposure? If yes, do you know what the results were?

Is there radiation (radionuclides, gamma, surface contamination, etc) in any areas where you work?

Do you work primarily indoors or outdoors?

Do you wear protective clothing when working outdoors in hot weather?

Do you work in greenhouses?

Do you work in any locations besides your primary work location? If so, describe.

Do you work with lasers?

Do you regularly work in noisy areas or around noisy equipment?

If there any special ventilation (exhaust hoods, fume extractors) in your workplace?

Do you work in any confined spaces?

What health and safety-related training courses are you required to take?

6. Probes should be used to obtain additional information sufficient for the interviewer to understand the job duties, personal protective equipment, and materials used, and to determine potential exposures. Probes may be directed to agents listed on the EJTA, for instance, "To your knowledge, do you work with or around any asbestos-containing materials?" Probes may also be used to clarify information.
7. Go over the list of exposures on the EJTA with the employee to ensure that no information about exposures has been missed. It is not necessary to fill out the entire potential exposure hazards (PEH) page during the interview, since it may be necessary to gather extra information to make these determinations. It may be completed during the interview if sufficient information is available to make exposure determinations.
8. After gaining an understanding of the employee's work, complete the other sections of the EJTA with the employee, in the following order: physical job requirements, medical qualifications, other exposure information, training. Ask any additional probing questions as needed to clarify. When asking about training, emphasize training which is required to perform the job. This may be different than the training which the employee received last year.

9. Interview ends. Ask if there are any questions. Thank employee and tell them to call if any questions arise.

EJTA Interview Notes

Date:

Employee Name:

Contractor:

Description of Job Tasks and Duties:

Exposure Agent Summary -

Note description of exposure agent, source, quantity, what process agent is used in, frequency and duration of exposure, PPE used.

Comments - use back of page if needed.

Did employee participate in original EJTA? Yes No Details:

